



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/708,618

03/16/2004

Susumu Noda

39.040

2617

29453

7590

06/01/2006

JUDGE & MURAKAMI IP ASSOCIATES
DOJIMIA BUILDING, 7TH FLOOR
6-8 NISHITEMMA 2-CHOME, KITA-KU
OSAKA-SHI, 530-0047
JAPAN

EXAMINER

BLEVINS, JERRY M

ART UNIT

PAPER NUMBER

2883

DATE MAILED: 06/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/708,618

Applicant(s)

NODA ET AL.

Examiner

Jerry Martin Blevins

Art Unit

2883

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 May 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO-9B/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 1, 2006 has been entered.

All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

Art Unit: 2883

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Response to Arguments

Applicant's arguments filed May 1, 2006 have been fully considered but they are not persuasive.

With regards to applicants' argument that one of ordinary skill would not be permitted to apply the teachings of Srinivasan to the technology of Akahane, examiner points out that the art taught by the two references is substantially similar, i.e. both references deal with the design and optimization of photonic crystal structures.

Furthermore, both references teach the desirability of improving the Q-factor of their respective devices. Examiner maintains that although the structure of the particular photonic crystals taught by Srinivasan and Akahane are not identical, one skilled in the art would glean valuable knowledge from the teachings of Srinivasan that, when combined with the structure taught in the applied reference to Akahane, would render the present claimed invention obvious.

With regards to applicants' arguments that a combination of the structures of the above mentioned prior art references would not yield the present invention, examiner points out that the obviousness rejection does not rely upon the precise structure of the secondary reference to Srinivasan. The claimed photonic crystal structure is present in the reference to Akahane, whereas Srinivasan teaches that the geometry of a point defect in a photonic crystal structure can be dimensionally altered in order to reduce

Art Unit: 2883

radiation loss. This teaching holds for photonic crystal structures in general and not specifically to the exact structure in the Srinivasan reference itself. A combination of the structure of Akahane with the disclosure of Srinivasan renders the presently claimed invention obvious.

Claim Rejections - 35 USC § 103

Claims 1-11 are rejected under 35 U.S.C. 103(a) as being obvious over Akahane, et al, "Design of a channel drop filter by using a donor-type cavity with high-quality factor in a two-dimensional photonic crystal slab", Applied Physics Letters, March 3, 2003, pages 1341-1343, in view of Srinivasan and Painter, "Momentum space design of high-Q photonic crystal optical cavities", Optics Express, July 29, 2002, pages 670-684.

Regarding Claim 1, Akahane teaches a two-dimensional photonic crystal configured by an arrangement, in a regular section of a two-dimensional lattice of points defined in a slab (page 1341, column 1, lines 1-2), of low-refractive-index substances having a small refractive index relative to the slab (page 1341, column 1, line 9 teaches that the low-refractive-index substances are air, while page 1342, column 1, line 22 teaches that the slab has a refractive index of 3.4) and being of predetermined identical dimension and shape (Figure 1), a cavity made from a point defect within the two-dimensional crystal, wherein: the point defect contains a plurality of three or more neighboring lattice points (specifically three as seen in Figure 1, L3 and T3), and in the

plurality of three or more lattice points, the low-refractive-index substances are missing from the arrangement (page 1341 column 2, line 19).

Akahane does not teach that at least one of the low-refractive-index substances, that would otherwise be arranged to correspond to at least one among those lattice points being nearest the point defect, is dimensionally altered from its predetermined dimension. However, Srinivasan teaches that the geometry of a point defect and the surrounding holes in a two-dimensional photonic crystal can be altered in order to reduce the vertical radiation loss from the photonic crystal slab (page 673, section 3, line 3 and page 670, Abstract, line 6). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teachings of Srinivasan, that is to dimensionally alter at least one of the lattice points nearest the point defect, to modify the teachings of Akahane. The motivation would have been to reduce vertical radiation loss in the slab.

Regarding Claim 2, Akahane in view of Srinivasan teaches the limitations of the base claim 1. Akahane but does not teach the further limitation that at least one among the lattice points being secondarily adjacent the point defect also is dimensionally altered from its predetermined state. However, the above reference to surrounding holes taught by Srinivasan can reasonably be interpreted as applying to secondarily adjacent lattice points, so the above obviousness argument applies to Claim 2, as well.

Regarding Claim 3, Akahane in view of Srinivasan teaches the limitations of the base claim 1. Akahane also teaches a point defect consisting of exactly three lattice points (referenced above), which is, by definition, fewer than six lattice points.

Regarding Claim 4, Akahane in view of Srinivasan teaches the limitations of the base claim 1. Akahane does not teach that the wavelength of light that resonates in the cavity is adjustable in dependency upon the dimension and shape of the point defect. However, Srinivasan teaches that the cavity will support various resonant modes that depend on the nature of the point defect (page 673, section 3, line 3). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teachings of Srinivasan, that is that the resonate wavelength of the light in the cavity is adjustable depending on the dimension and shape of the point defect, to modify the teachings of Akahane. The motivation would have been to confine light of a wide bandwidth.

Regarding Claim 5, Akahane in view of Srinivasan teaches the limitations of the base claim 1. Akahane also teaches that the plurality of lattice points which form the point defect are lined in a line segment (page 1341, Figure 1, L3).

Regarding Claim 6, Akahane in view of Srinivasan teaches the limitations of the base claim 1. Akahane also teaches that the low-refractive-index substances are filled into columns perforating the slab (page 1341, Figure 1).

Regarding Claim 7, Akahane in view of Srinivasan teaches the limitations of the base claim 1. Akahane also teaches that the lattice points of the two dimensional lattice are arrayed in a triangular lattice (page 1341, column 1, line 8).

Regarding Claim 8, Akahane in view of Srinivasan teaches the limitations of the base claim 1. Akahane also teaches that the slab has a refractive index of 2.0 or

Art Unit: 2883

greater. (Specifically, the slab index of refraction is given as 3.4 on page 1342, column 1, line 22).

Regarding Claim 9, Akahane in view of Srinivasan teaches the limitations of the base claim 1. Akahane also teaches that the low-refractive-index substances are air (page 1341, column 1, line 9).

Regarding Claim 10, Akahane in view of Srinivasan teaches the limitations of the base claim 1. Akahane also teaches a channel add/drop filter comprising at least one waveguide from a line defect within a two-dimensional photonic crystal, the cavity being disposed adjacent the waveguide, within a separation in which an electromagnetically reciprocal effect is produced between the cavity and waveguide (page 1341, Figure 1(a)). However, Akahane does not teach the combination of the above waveguide with the cavity as set forth in claim one, but rather Akahane teaches the above waveguide adjacent to a single point defect cavity. Akahane does teach that a three-hole point defect cavity has a higher Quality factor than its one-hole counterpart (Table 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Akahane in order to create a channel add/drop filter, as specified in Claim 10, that has a greater Quality factor than the one actually taught by Akahane. The motivation would have been to increase the Quality factor of the filter.

Regarding Claim 11, Akahane in view of Srinivasan teaches the limitations of the base claim 10. Akahane does not teach a plurality of cavities where the cavities differ from one another in resonant frequency. However, Srinivasan, as mentioned above (page 673, section 3, line 3) teaches that the resonant frequency of the cavity depends

Art Unit: 2883

on the dimension and shape of the point defect. It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teaching of Srinivasan, that a plurality of cavities can differ from each other in resonant frequency depending on the dimension and shape of the cavity point defect, to modify the add/drop filter taught by Akahane. The motivation would have been to broaden the bandwidth of the add/drop filter.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

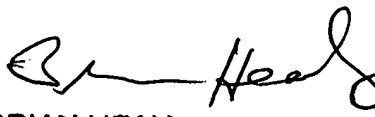
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jerry Martin Blevins whose telephone number is 571-272-8581. The examiner can normally be reached on Monday through Friday.

Art Unit: 2883

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JMB


BRIAN HEALY
PRIMARY EXAMINER
ART UNIT ~~2881~~ 2883